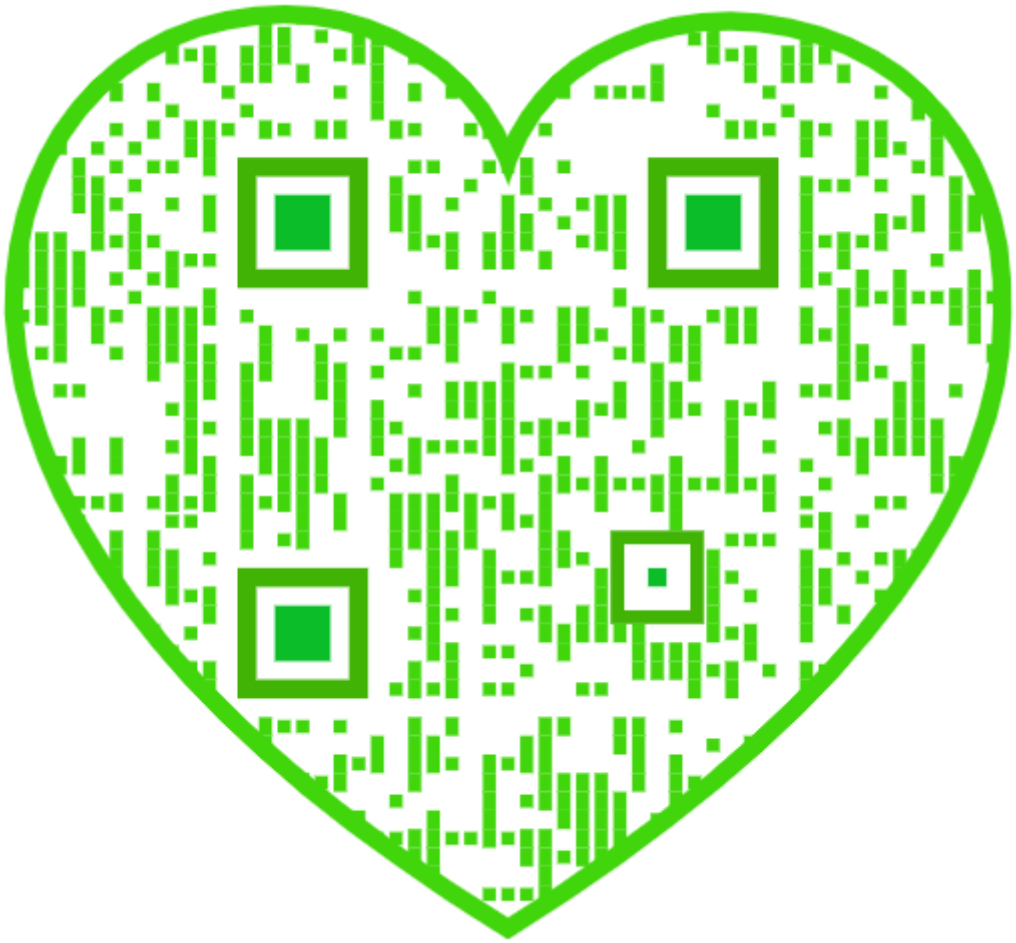

A

COMPANION

TO THE

NEW RIFLE MUSKET.

BY

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Second Edition, with Additions.

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PREFACE TO SECOND EDITION.

WHEN the "Enfield Rifle Musket" was first introduced into the British Army, it was apparent that some clear and definite rules should be laid down for the Soldier's guidance in the treatment and management of that arm, so that, by proper care and attention on his part, it should be kept in a state of perfection, which would always ensure a firm reliance on its efficiency when required for use.

To meet this want, I was induced by Major, now Colonel, A. Lane Fox, Grenadier Guards, then Chief Instructor of Musketry at Hythe, to write my "Companion to the Rifle Musket." Having done so, and obtained his approval of my labours, the First Edition of this Work was accordingly published.

The favourable reception which it met with, its ready sale and introduction into the Military Libraries and Reading Rooms, is a proof of its

having accomplished the object for which it was written.

To Major General C. C. Hay, the Commandant of the School of Musketry, Colonel E. Wilford, the Chief Instructor, and Captain J. Mc.Kay, the Deputy Assistant Adjutant General of the School, I am deeply indebted for their good opinion of my labours, and their kindness, in receiving the little Work on its first appearance. I here offer them the expression of my grateful thanks.

The Second Edition has been arranged to meet the alterations made by late improvements in the system of instruction; and such information is added, as I hope will induce soldiers to take a real interest in the beautiful weapon intrusted to their charge.

The best shots in a regiment are those men who make themselves masters of the theory and practice of Rifle firing, and take the greatest pleasure in keeping their arms in a clean and perfect state. In ancient days a soldier's arms were his pride, and wealthy chieftains delighted in armour of great price. But what comparison would the arms of the ancients, with all their costliness bear to the present effective English Rifles?

When Glaucus exchanges his arms with Diomed as a token of friendship, their value is thus described by "Homer:"—

> "For Diomed's brass arms, of mean device,
> For which nine oxen paid (a vulgar price),
> He gave his own of gold divinely wrought;
> A hundred beeves the shining purchase bought."

Among all savage nations their rude weapons, whether intended for war or the chase, are regarded with almost personal affection and veneration.

Surely then, it becomes the duty of every British Soldier, to hold in high esteem one of the most perfect weapons (if properly used), that science has yet placed in his keeping.

S. B. B.

Garrison Library, Chatham.

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INTRODUCTION.

THE object of this little book is, to make the Soldier acquainted with an easy and effectual mode of cleaning his Rifle, and of keeping it in a proper state so that it may always be ready for immediate use. Some further information is given, which, if properly attended to, will enable the Soldier to become perfectly familiar with his weapon, and with its various parts; and, this being accomplished, he may always feel sure that, in his Rifle, he possesses not only an intimate acquaintance, but a trusty friend in time of need.

The Soldier should always be prepared to see danger without surprise, and to meet it without doubt or hesitation—hence the necessity of keeping in perfectly good order the chief arm of his defence as well as of attack.

A Frenchman once wrote a book about the best way of blowing out a candle. "There is," said he, "a right way, and a wrong one, and it often happens that we fall into the wrong one, because we have not taken the trouble of making ourselves well acquainted with the object we have to deal with." How important is it then, that, with the introduction

into the Service of the Improved Rifle, a few easy and defined rules for its treatment—the result of practical experience—should be placed before the Soldier whose duty it is, and whose pleasure it should be, always to have in the highest state of efficiency the weapon entrusted to him.

It is not alone necessary that the Soldier should be taught merely how to clean and to keep his Arms in order. He should further be made thoroughly to understand what particular work each separate part of his Rifle has to perform in connection with the whole, and of what importance it is that not the slightest irregularity should exist in even the minutest part of the weapon. Like the bundle of sticks we read of in the fable, the Rifle must be kept well together;—each part must be thoroughly clean, properly placed, and the whole screwed home. The Rifle will thus be made firm, the parts will act smoothly together, and the weapon will do its work well. But if from indifference, from bungling, or from neglect, the parts are wrongly put together, or one screw left loose, the result will be failure, mischief, and disgrace.

A Soldier who does not fully appreciate the trust reposed in him when a valuable Rifle is placed in his hands, and who cannot be trusted to keep it clean and in proper order, will do no credit to his Regiment, and be of little use to the Service. The new Rifle Musket is made of the best and strongest materials known in the gun trade, and in the most scientific

manner: it only requires proper treatment and handling to keep it in a high state of efficiency.

The present Rifle Musket is a very superior weapon to the old one or to the Minié Rifle. The barrel of the Enfield Rifle is fastened to the stock by a breech nail, and is also encircled by three iron bands of great strength; these bands being kept in their places by springs. Some Rifles have also the "*Screw Band*," *i.e.* instead of having a spring to keep the band in its place, the band itself is fitted with a small screw, or nut, for the purpose of either loosening the band or of binding it to the barrel.

The greatest facility, however, is afforded by either of these two methods in taking the barrel from the stock; in the former by merely pressing the springs and lifting the bands, and in the latter by unscrewing the nut, and thereby loosening the bands from the barrel, so that they may be easily removed. In the old pattern Musket the number of fittings were sixteen, which in the present Rifle have been replaced by four, as above stated.

This system of fitting the barrel to the stock has been found to have a greater advantage than loops and pins; as in a trial to ascertain the comparative strength of the two systems, the bands were found capable of sustaining a pressure of 106 lbs. more than the old fastening with loops and pins; the breaking weight in each case being—for the old pattern, 175 lbs.; for the new, 281; difference in favour of the bands, 106 lbs.

The present bayonet and fittings differ entirely from the old ones, both in lightness and construction. First, they contain less metal: secondly, the bayonet has three grooves, which add to its efficiency; the socket is small, and fastens to the muzzle by a "*locking ring*," instead of the spring in the stock. In order to enable the Soldier to appreciate the advantage of this seemingly trifling, but, in reality, important improvement,—the "locking ring,"—he should be informed that the cavity made in the stock of the old Muskets to receive the bayonet spring, was a source of great injury to the gun, inasmuch as dirt and wet would enter, and thereby cause rust to accumulate about the barrel and the stock, which could only be removed by dismounting the barrel.

The ramrod * is constructed with a swell near the head, which also acts as a spring to keep it in its place. The Instructor should shew the Soldier that the swell of the ramrod will greatly assist him (when the bullet requires more force than usual through fouling in the barrel), in starting the bullet a few inches down the barrel, by the facility it offers for grasping the rod at that particular point. The head of the ramrod is made in the form of a jagg, so that instead of having a separate jagg, carried in the pouch, it now forms part of the ramrod itself.

The superiority of the swivel lock over the hook lock of the old Musket arises mainly from the princi-

* The Rifles fitted with "screw bands" have a straight rod.

ple on which the tumbler is acted upon by the main-spring. In the present swivel lock, the main-spring is connected with the tumbler by means of a chain or swivel, which is suspended from the shaft of the tumbler to receive the claws of the main-spring, so that, when the tumbler revolves, no impediment arises from friction. In the swivel lock friction is reduced so much that it never can exceed one per cent.; consequently as soon as the sear nose is disengaged from the bent, the tumbler is put in motion without offering in itself any opposition by friction.

The beautiful principles developed in the construction of a good swivel lock cannot be surpassed. The formation of the tumbler, when assisted by the swivel, gives an arrangement of leverage partaking of the multiplicate; for the weight, when approaching full cock, is lessened by the lever bringing the moving force into the immediate vicinity of the tumbler, and when down on the nipple increasing or multiplying that force by the divergence from the axle.

Mr. Greener, a celebrated gun maker, says there is a great degree of skill displayed in the making of locks, though to the casual observer it does not appear. On the simple hanging of the swivel depends all the sweetness of the play of the main-spring, and on the placing the hole for the sear pin, depends the sweetness of the sear playing on the tumbler.

All locks for percussion should have the greatest strength of main-spring at the moment they strike the nipple, or what is termed when the lock is down.

On the pitching the sear depends the cutting of the bents, and on their formation the danger of the lock catching at half cock, when the trigger is made to pull easy.

In the hook lock (vide plate XI.) the end (or toe), of the main-spring must travel up an incline when cocking, and down when firing; consequently a large amount of leverage is destroyed by friction, which is very considerable. Hence the velocity and consequent force of the hammer in the swivel lock is greater, and its action more free and smoother than that of the hook lock.

Two springs of equal force and flexibility, fitted to locks of the hook and swivel pattern, will be found to communicate velocities varying according to the amount of friction generated in their action.

It is almost superfluous to observe, that with such an admirable weapon placed in the hands of the Soldier, he is bound in honour to keep it in a state of perfect efficiency, and ready for use at a moment's notice.

Too much care, therefore, cannot be taken to ascertain its condition, by frequent inspections, not only on parade, but also in the barrack rooms. It must be perfectly free from rust, and other damage. It cannot be too often impressed upon the mind of the Soldier, that if rust be allowed to accumulate in the barrel the bullet will be prevented from taking the rotatory motion, which is actually essential to the accuracy of its flight. Hence it is proved that the

accuracy of the flight, and, consequently, the due execution of the bullet, is not dependent solely on the rules laid down in the theory and practice of firing, but that the perfect condition of the Arm itself is necessary to secure due and efficient execution.

Defects in the structure of the Rifle itself will sometimes occur; and these, the Soldier, if ignorant or inexperienced in its treatment, may be unable to detect or rectify. He may never hit the mark; he may get the name of a bad shot, and his bad firing be attributed to his incompetence; whereas, if there were no defects in his Rifle, he might prove to be as good a shot as his comrades. This should be thoroughly explained to the Soldier, in order that he may become the more zealous in his efforts to detect and rectify any accidental defects in his weapon.

The Rifle may not have a proper bore; such a defect is, however, of very rare occurrence. In such cases the cartridge is found to ram down hard, or on the contrary, is very loose in the barrel. Such faults should be immediately reported.

Many important remarks on the inherent defects of Rifles will be found in the various valuable works and lectures on Rifle Firing.

Soldiers, more particularly the younger ones, should be taught, when cleaning their Arms, to take the greatest care not to rub or damage the *foresight;* this many unthinkingly do, not knowing

how greatly such damage may operate against them at the time of trial. The lock, too, must not only be quite clean, but oil must also be applied to the parts that rub. For want of a little oil, the trigger will sometimes pull hard, and cause the firer to alter the direction of the piece while in the act of firing. This affords further proof of the importance of keeping the lock in good easy working order.

Another important point cannot be too strongly enforced, or too strictly attended to. If, through accident, carelessness, or neglect, any dent in the barrel should be made, or the barrel itself become bent, it may burst in the Soldier's hands. If, therefore, the lock should become wood-bound, the nipple injured, or any part of the Rifle damaged, which it is not in the Soldier's power to remedy, he must immediately report such damage, that the armourer alone may repair it. On no account must the Soldier himself attempt such repairs.

Young Soldiers are sometimes not aware that the explosion of a cap upon the nipple, when there is no charge in the barrel, causes more rust than the firing of a charge. Instructors must, therefore, insist upon the necessity of thoroughly cleaning and oiling the Rifle after a practice of snapping caps.

In order to keep the muzzle and lock as free as possible from exposure to rain, the Rifle must be carried at the "*Secure*;" the rain will then run off the muzzle, while the lock is safe under the arm.

When "*Ordering Arms*," the butt should be

placed gently on the ground, thereby avoiding injury to the mechanism of the lock, which will occur if the butt is struck violently against any hard substance.

The Soldier having learned the names of every part, and seen the manner in which the Rifle is taken to pieces, the Instructor should then make him dismount the Arm himself, and for each thing that he is about to perform, repeat aloud the instructions for doing it; by this means he soon learns how to give instructions to others.

The preceding remarks are not intended as mere introductory matter, to be forgotten as soon as read, but as a part of the instruction which should be read and carefully explained by the Instructor to his pupils. He should also explain to them (when opportunities offer), the vast and important modifications guns and gun locks have undergone since they were first brought into use. How great the difference between the first method, viz.—ignition from a match held in the hand—the second, by that of a match placed in the jaws of a cock, and brought into contact with the priming, by means of a spring trigger: the third, by the rotation of flint and steel from the wheel lock; or the fourth, by the flint lock, and the smooth and instantaneous production of fire by the present well-finished percussion or detonating lock.

The first spring locks, it is said, were made in Germany and in the city of Nuremberg, in 1517.

Could the early gun-lock makers witness the perfection to which the present locks have been brought, we may imagine with what amazement and admiration they would regard them.

It is hoped that these remarks may be the means of inciting the young Soldier to seek for further information respecting the use of military weapons, and the great improvements they have undergone since their first invention by man.

The present system of Rifle Instruction tends in the greatest degree to improve the mind of the soldier, causing him to study and master (during his leisure hours), such points of instruction as in the lecture-room often seems difficult to understand. "I know," (says Major General Hay, the Commandant of the School of Musketry), "of no system or subject of training that has been introduced into the Infantry Service, better calculated to promote the interest of the school than that of Musketry Instruction, which calls into exercise the thinking faculties of the men, and incites in them a desire to acquire the art of reading, and the knowledge of other useful subjects, that they may understand this branch of their military training more perfectly. I have witnessed the greatest desire on the part of the men for opportunities for mental improvement, and am convinced that the system under consideration, supported and stimulated by the recent scheme for prizes for good shooting, will do much to increase the attendance at school."

A good shot will have his Rifle always in a clean and perfect state.

It has been by attention and study that British Soldiers are brought to a degree of perfection in the use and knowledge of their Arms, that enables them to surpass all troops in the world, and to remain unrivalled among the armies of the earth.

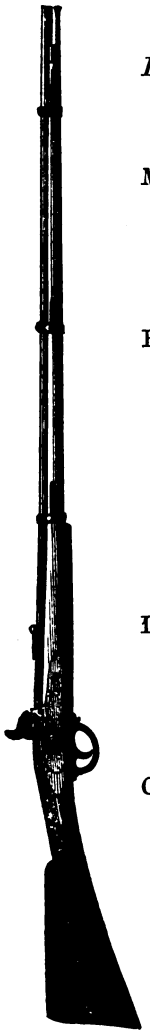
In conclusion, I would earnestly urge upon Rifle Instructors, to point out to their pupils how to take advantage of the many excellent works contained in the Military Libraries; from which they may gather the whole history of fire-arms, from the first invention of gunpowder, through the successive steps by which the Rifle Musket has attained its present efficiency. Every encouragement is now held out to those Soldiers who perseveringly apply their mind to the attainment of excellence in their profession as marksmen. They have opportunities of improving themselves by the schools and libraries, that many thousands of hardworking men in civil life yearn for, but have not the privilege of enjoying. It is in the power of every young Soldier to store his mind with such an amount of sound experimental knowledge, as shall enable him to say with truth and pleasure,

"Of highest genius 'tis my pride,
To comprehend what art has done;
To know the law her steps that guide,
And share the glories she has won."

S. B. B.

DESCRIPTION OF PLATES.

PLATE I.



Description of Enfield Rifle Musket, 1853,
(fitted with solid bands.)

Musket—

Length	without	Bayonet,	4 ft. 7 in.
Do.	with	do.	6 ft. ½ in.
Weight	without	do.	8 lb. 8 oz.
Do.	with	do.	9 lb. 3 oz.

Barrel—

Weight, 4 lb. 2 oz.
Length, 3 ft. 3 in.
Number of Grooves, 3.
Depth of do. ·014 in.
Width of do. ·262 in.
Spiral, ½ turn in 3 ft. 3 in.
Bore { Diameter at Breech / Do. at Muzzle } ·577 in.

Lock—Swivel.

Main Spring draws at half cock, 13 to 14 lb.
Pull of the Lock, 13 to 14 lb.
Sear Spring draws 7 to 8 lb.
Trigger drawers, 7 to 8 lb.

Charge—

Bullet—Weight, 530 grs., length, 1·03 in., diameter, ·568 in., windage, ·009.
Powder, 2½ drams FG (fine grain).
Weight of 60 Rounds and 75 Caps, 5 lb. 8 oz. 4 drs.
Charge of Powder in proportion to Bullet } Bullet weighs 7·75 Charges.

PLATE II.

The Swivel Lock (outside).

A Sear Spring Pin
B Sear Spring Pin
C Bridle Pin

PLATE II.

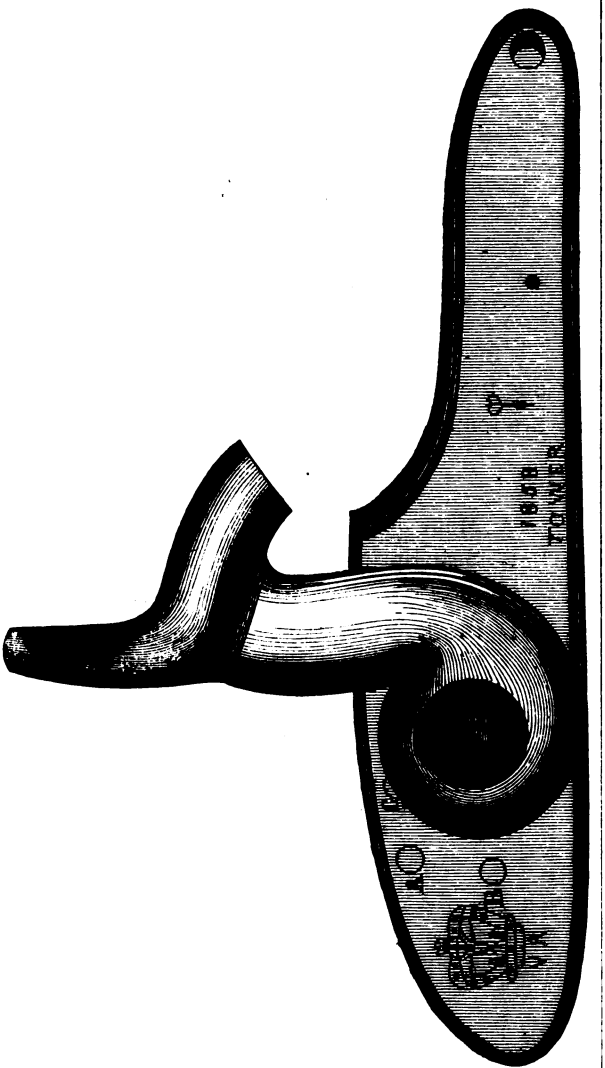


PLATE III.

The Lock.

Name the limbs of the Lock in the order in which they are removed.*

A Main Spring	E Hammer
B Sear Spring	F Tumbler
C Sear	G Swivel
D Bridle	H Lock Plate

Pins.

a Tumbler	*c* Sear
b Sear Spring	*d* Bridle

* Vide Order of Instruction, page 57. (First Lesson).

PLATE III.

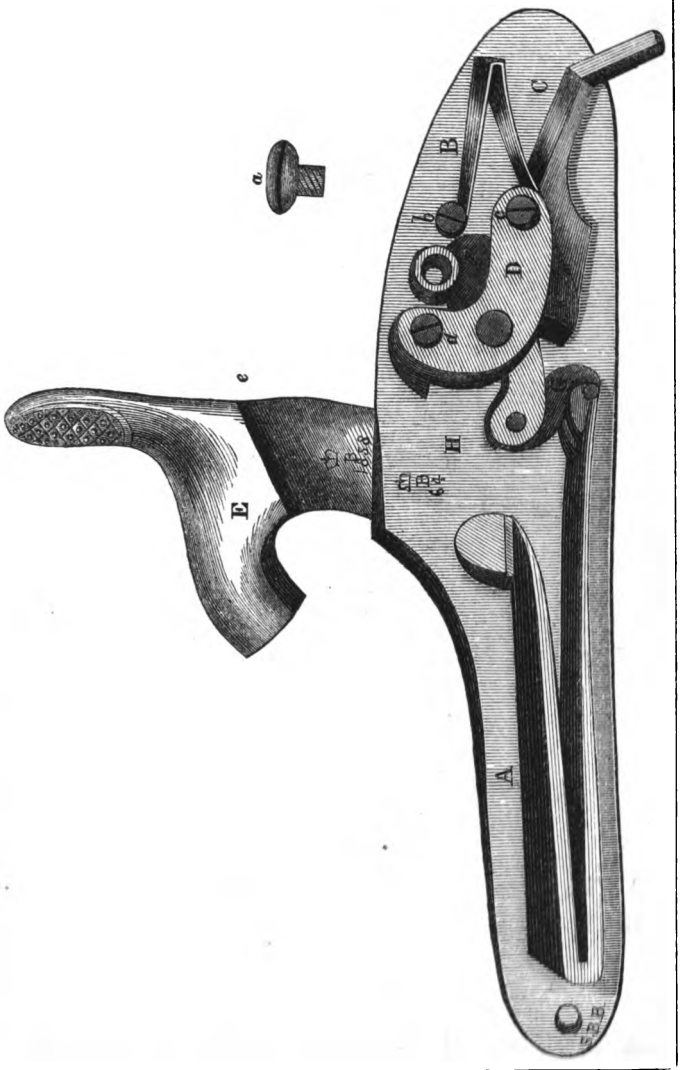


PLATE IV.

The Stock.

A The Nose Cap
B The Bands
C The Swell
D The Lock Side
e Projection
F The Head
G The Small
H The Trigger Guard
i The Trigger Plate—
(Vide Plate V., fig. 2.)
k The Trigger—
(Vide Plate V., fig. 2.)
L The Butt—
a The Toe *l* The Heel
M The Heel Plate
N The Band Springs
O The Breech Nail
P The Side Nails

The Barrel.

A The Muzzle
B The Front or Fore Sight
C The Back Sight
D The Nipple Lump

The Bayonet.

A The Blade B The Socket C The Locking Ring

PLATE IV.

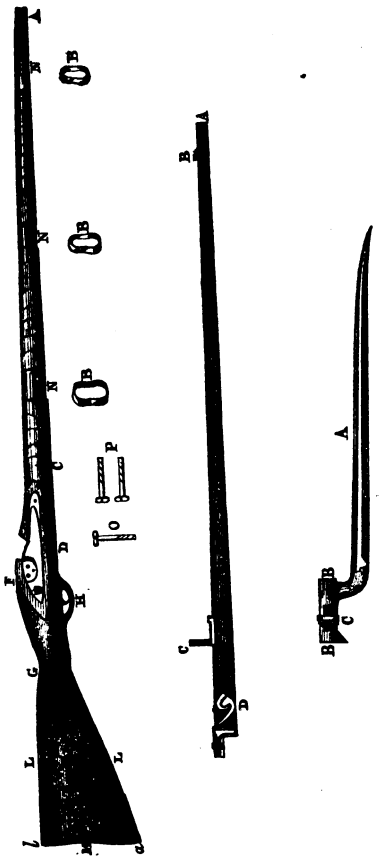


PLATE V.

Fig. 1.—*Back or Elevating Sight.*

a The Bed
b The Flanges
c The Slider
d The Flap
e The Pin
f The Spring
g The Cap

Fig. 2.—*The Trigger.*

a The Trigger
b The Finger
c The Box
d The Stud
e The Plate

PLATE V.

Fig.1

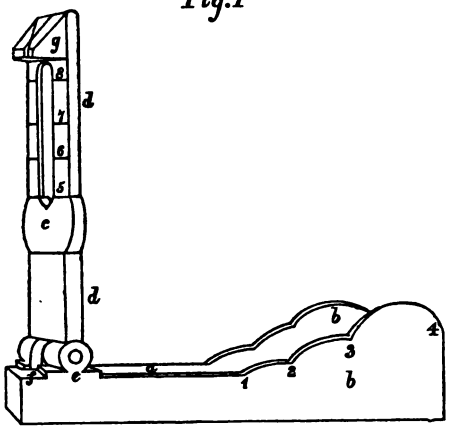


Fig.2.

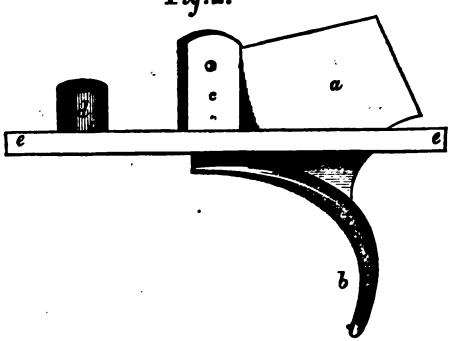


PLATE VI.

Fig. 1.—*The Breech Pin.*

a The Face
b The Screw
c The Neck
d The Tang
e Breech Nail Hole

Fig. 2.—*The Nipple.*

a The Cone
b The Square
c The Shoulder
d The Screw
e The Touch Hole (vide Section of Nipple *f*)

The Ramrod (*in part*).

a The Head and Jagg
b The Swell*

* All Rifle Muskets fitted with the solid bands and springs have this description of "Rod." Those fitted with the "Screw Bands" are straight from "head to toe."

PLATE VI.

Fig. I

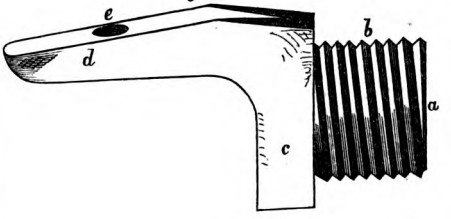


Fig. 3

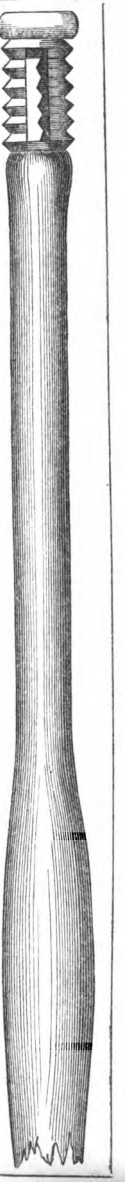


Fig. 2.

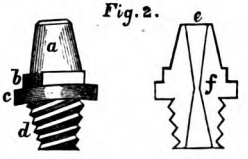


PLATE VII.

Name the various parts of the limbs of the Lock*

Figs. 1 *and* 2.—*Main Spring* (*two ways*).

A	Catch	D	Bend
B	Return	E	Claws
C	Stud	F	The Spring

Figs. 3 *and* 4.—*Sear Spring* (*two ways*).

A	The Eye	D	Bend
B	Return	E	Spring
C	Stud	F	Toe

Fig. 5.—*The Sear.*

A	Arm	D	Neck
B	Body	E	Nose
C	Eye		

* Vide Order of Instruction, page 57. (Second Lesson)

PLATE VII.

Fig. 1.

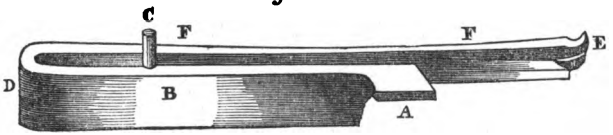


Fig. 2.

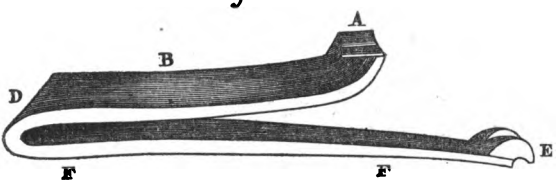


Fig. 3.

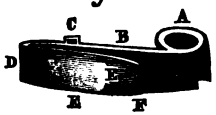


Fig. 4.

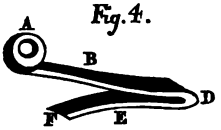


Fig. 5.

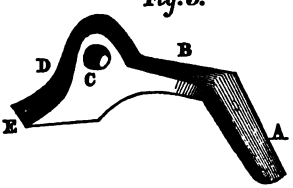


PLATE VIII.

Fig. 1.—*The Bridle.*

A Stud
B Foot
C Bridle Pin Hole
D Tumbler Pivot Hole
E Sear Pin Hole

Fig. 2.—*The Hammer.*

A Mouth
B Head
C Comb
D Neck
E Body
F Tumbler Square Hole

Fig. 3.—*The Tumbler.*

A The Pivot
B Bearer
C Shaft
D Swivel Stud or Pivot Hole
E Half Bent
F Full Bent
G Axle
H Squares
I Pin Hole

Fig. 4.—*The Swivel.*

A Body
B Studs or Pivots

PLATE VIII.

Fig.1.

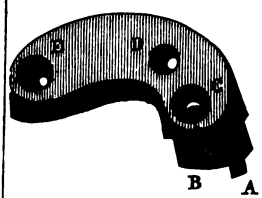


Fig.2.

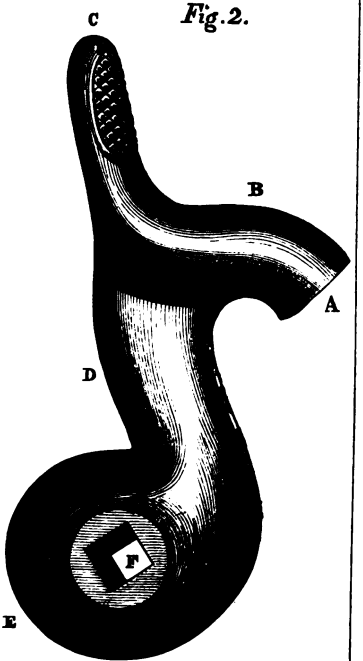


Fig.3.

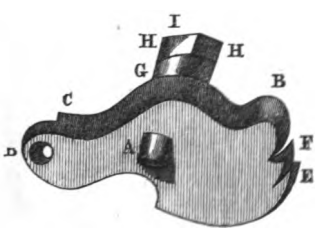


Fig.4.

PLATE IX.

The Lock Plate (inside).

A Front Side Nail Hole
B Main Spring Stud Hole
C Fore Stud
D Bridle Stud Hole
E Bridle Pin Hole
F Hind Stud (and Hind Side Nail Hole)
G Sear Spring Pin Hole
H Sear Spring Stud Hole
I Sear Pin Hole
K Tumbler Axle Hole

N.B.—For Third Lesson, Vide page 60.

PLATE IX.

PLATE X.

Improved Nipple Wrench and Spring Cramp.

Fig. 1.

Main Spring in Cramp as taken from the Lock in dismounting.—(Vide First Lesson.)

Fig. 2.

A The Nipple Wrench
B The Cramp Hook
C The Worm or Double Wrench
D The Turnscrew.
E The Oiling Wire
F The Reservoir for Oil
G The Lever
H The Stud
I The Pricker (*Fig.* 1., I.)

Some Nipple Wrenches have been fitted with a "Ball Drawer" (*Fig.* 3), and a "Drift" (*Fig.* 4), both used for extracting the bullet from the barrel when necessary. The former screws into Nipple Wrench; the latter into the reservoir, and acts for the same purpose as the oiling wire.

PLATE X.

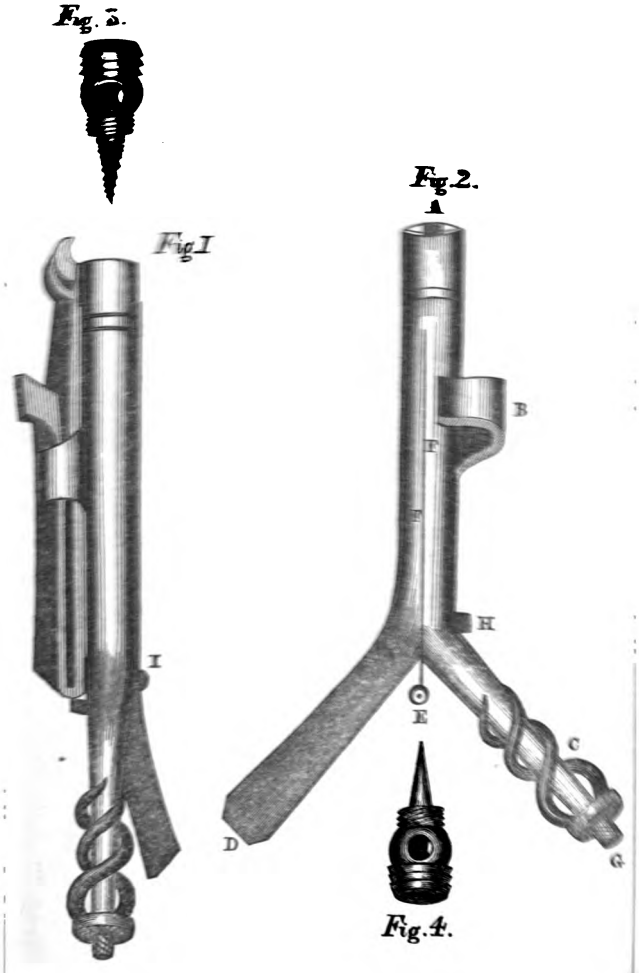
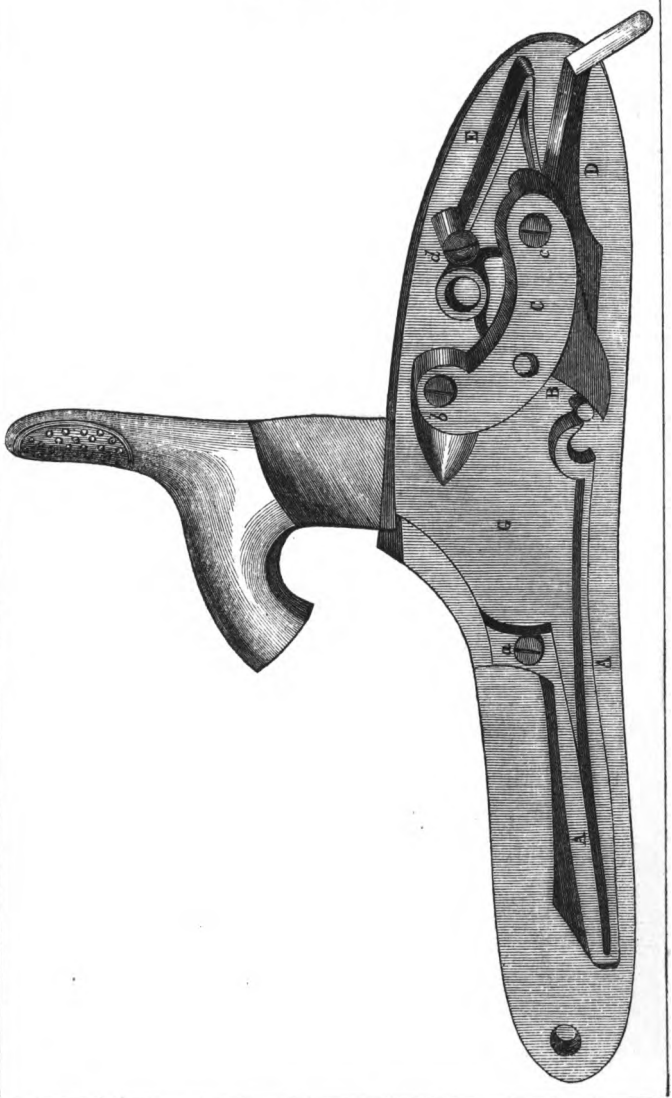


PLATE XI.

The Hook Lock.

A The Main Spring
a The Eye of the Main Spring
B The Hook of the Tumbler
C The Bridle
D The Sear
E The Sear Spring
b The Bridle Pin
c The Sear Pin
d The Hind Stud

PLATE XI.



The Circular Trigger.

As the Circular Trigger has been fitted to several of the Rifle Muskets, I think it very essential that the Soldier should have an opportunity of thoroughly understanding the excellent principles upon which this new invention acts. The following information will therefore prove of great service to those who are unacquainted with its merits, and enable them in practice to prove the very great advantage gained by understanding the theory of the invention.

From my own experience as a teacher at the School of Musketry at Hythe, I always found my pupils most anxious to possess a Rifle fitted with the "Circular Trigger;" they were always certain of making better firing than with those fitted with the Lever Trigger, Plate V., fig. 2, and the result of the practice generally proved the correctness of their judgment.

THE CIRCULAR TRIGGER.

Invented by Captain Harris, Royal Marines Light Infantry.

PATENT.

THE object of this Invention is to do away with a very great and universally acknowledged defect in the "pull off" of fire-arms fitted with the present or Lever Trigger.

The well-known difficulty at present experienced in obtaining a *Fine, Light, and Safe* pull off, arises from the inability of a simple *Lever* to combine *all* these qualities, for it is well known and admitted by all Sportsmen and Gunmakers, that with a *safe* or *strong* Lock, if a *short* pull is required, it is so *hard* as to *completely destroy* the best aiming, and a *long* pull is such a *series* of *jolts* as to be quite inadmissible. Again, if the Lock is made *light*, a *loss of safety* ensues to a certainty.

Thus, instead of the "*Fineness*," "*Lightness*," and "*Safety*" we seek, we find ourselves hemmed in by "Hardness," a jolting pull or "Drag," or a *Loss* of "Safety;" and we cannot avoid one of these defects without bordering on another of them.

The result has been, that the Hardness and Drag being so extremely disagreeable, a Loss of Safety has been submitted to for the purpose of obtaining the only kind of pull tolerable in a lever, *i. e.*, Fine and Light, or *short* and *light*;—thus, the *Defect* of the

Principle used, and not the *Requirements of Aiming*, have made a *short* and *light* pull the *proverbial demand*, to the detriment of *safety*;—that this deduction is true is proved by the existence of the Hair Trigger, which is the *perfection* of *shortness* and *Lightness* of pull; but it is so *dangerous* as to be quite shunned for general service and usefulness.

Now, the Circular Trigger is a Cam, or union of the *Lever* with the *wedge*, which gives such enormous power that a strong or safe Lock may be discharged with a very light and easy pull, and by the particular application of the mechanical principles used in its construction, the pull is also *even throughout*, which entirely obviates the *hardness* or *jerk and "Drag"* so detrimental to good shooting.

Thus *Safety* and *Lightness* of pull, two of the requirements mentioned above, have been obtained by the use of the Circular Trigger, the third point *"shortness"* is not attained *in the Trigger*, nor could it be without springs and complications which have been shown in the Hair Trigger to make it dangerous. But shortness of pull is attainable, *if* and *when* required, in the Circular Trigger, because the force requisite to use it is so very little (about 3 lbs. for a military Gun, and 1 for a sporting Gun), that the *Finger can make the action of pulling as short as necessary*, and after some practice with this Trigger, by pulling it partly off and there resting, the final discharge is made, not only as fine and light as the best Hair Trigger, but *perfectly safe*, and quite *controllable*, whilst one is almost afraid to

touch the Hair Trigger. The extremely easy and *sliding* pull of the Circular Trigger makes its use not only very *pleasant but greatly assists steadiness of aim.*

To Sportsmen this Trigger offers the advantage of safety when carrying the Gun at Full-cock, for no inanimate object is at all likely to retain its hold sufficiently to pull the Trigger the whole way off, and when it quits its hold, the sear is made to return to its place in the Top Bent.

Time is saved in making use of a good Rifle aim when obtained, for it is perfectly safe to put the finger already on the Circular Trigger when aiming, and there is nothing to do but to shut it up close in the twinkling of an eye when the aim is complete, whereas one dare not put his finger on the Hair or Common Trigger till *after* the aim is perfect, and in that moment it may be lost.

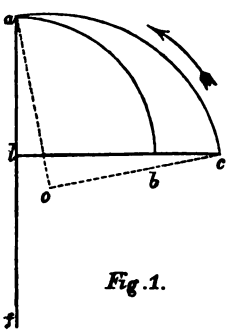


Fig. 1.

Figure 1 shows the principle of the Circular Trigger, *a d f*, or *c d f*, being the Lever part, and *c b a* the Wedge, which is struck from a particular centre *o*; *d* is the axis of the Lever and Trigger. As the Trigger, revolving upon the axis *d*, moves the wedge *a b c* in the direction of the ARROW, the sear resting on the surface of the wedge is gradually and evenly forced up until the gun is discharged.

Figures 2, 3, and 4, show the form and action of the Circular Trigger—*i. e.*, Fig. 2 shows the sear securely locked in the safety-notch of the Trigger at half-cock, making a pull-off in this position, or any danger, impossible. When the cock is down the sear is similarly locked. Fig. 3 shows the position of the sear and Trigger at full-cock, the former having escaped from the safety-notch in the act of cocking —the Trigger is now free to move. Fig. 4 shows the positions of the sear and Trigger at the moment of discharge, the sear having been wedged up as before explained.

The Circular Trigger is readily applicable to all kinds of Firearms, and requires but a slight and easy alteration in the gaiting of the Tumbler, and the form of the sear arm.

Besides the great advantages of removing the Jerk and Drag, and admitting the use of a safe and strong lock, a careful inspection of this principle will show, that—

1. It simplifies the form of the lock about the half-bent.
2. Ensures greater safety.
3. Saves the lock a deal of wear and tear.
4. Keeps the wet and dirt out of it.
5. Cannot get out of order, being so extremely simple in formation.
6. Is inexpensive; for, in new guns it would cost a slight addition to the expense, and not much those in use.

PLATE XII.

Fig. 2.

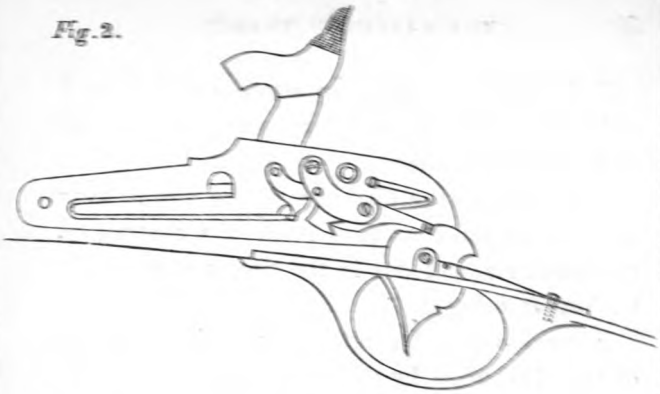


Fig. 3.

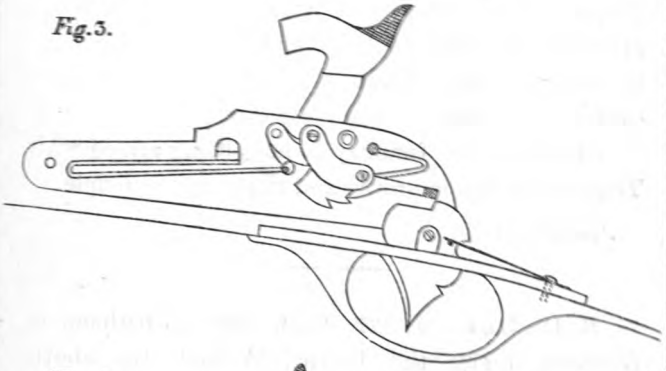
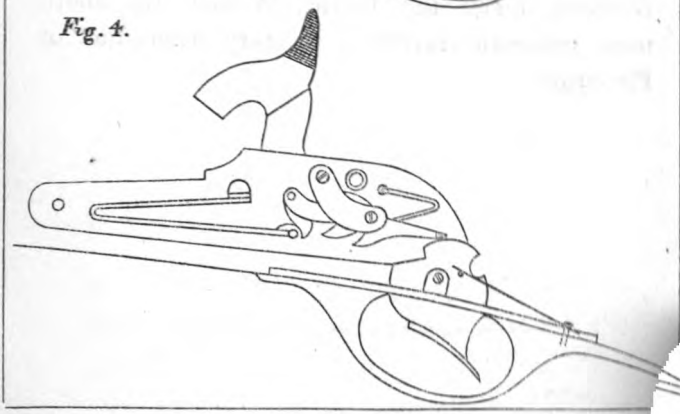


Fig. 4.



7. It allows of the gun being *safely* carried at *full cock*, or even the half bent being quite dispensed with in sporting guns.

8. It reduces the discharge of the gun to *one single motion* when the aim is ready, the contraction of the forefinger, and this in the *time* most agreeable to the person using it.

A continued and lengthened trial has been made of this Invention by the Government: it has been pronounced, by competent authority to be sound in principle, safe and unobjectionable in practice, and to overcome that defect which in the old Trigger cannot be obviated by *any amount* of practice.

A Regiment of Infantry is now being armed with Triggers on this improved and important principle.

January, 1858.

B. De La Cour, 327, High Street, Chatham, is Licensed, under the Patent, to apply the above most important invention to every description of Fire-arms.

PLATE XIII.

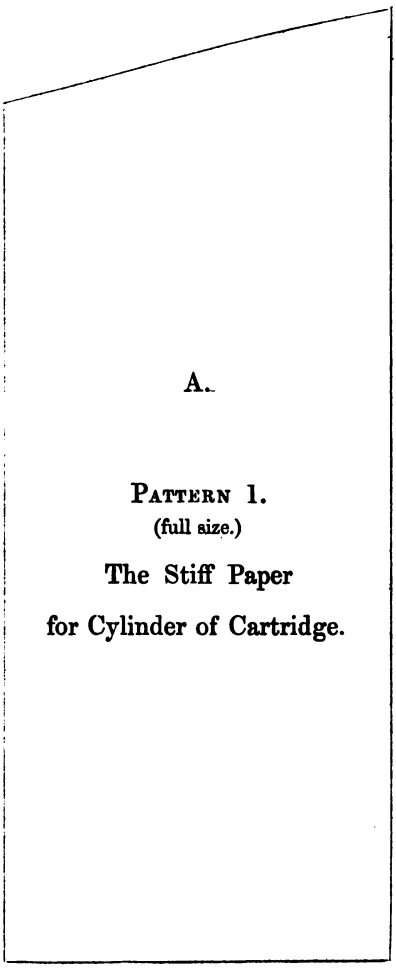

A.
PATTERN 1.
(full size.)
The Stiff Paper
for Cylinder of Cartridge.

PLATE XIV.

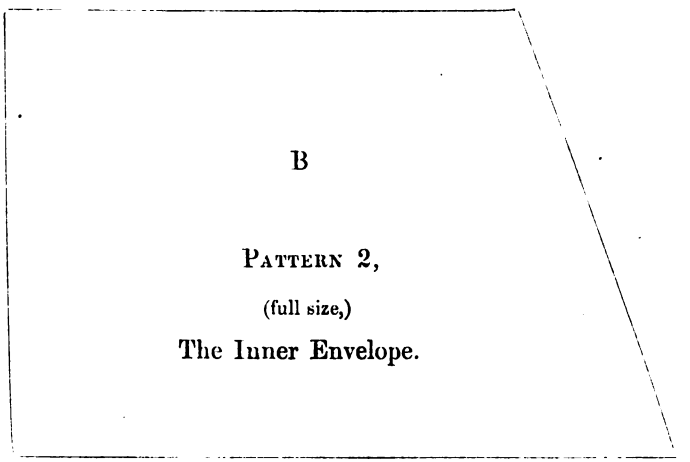
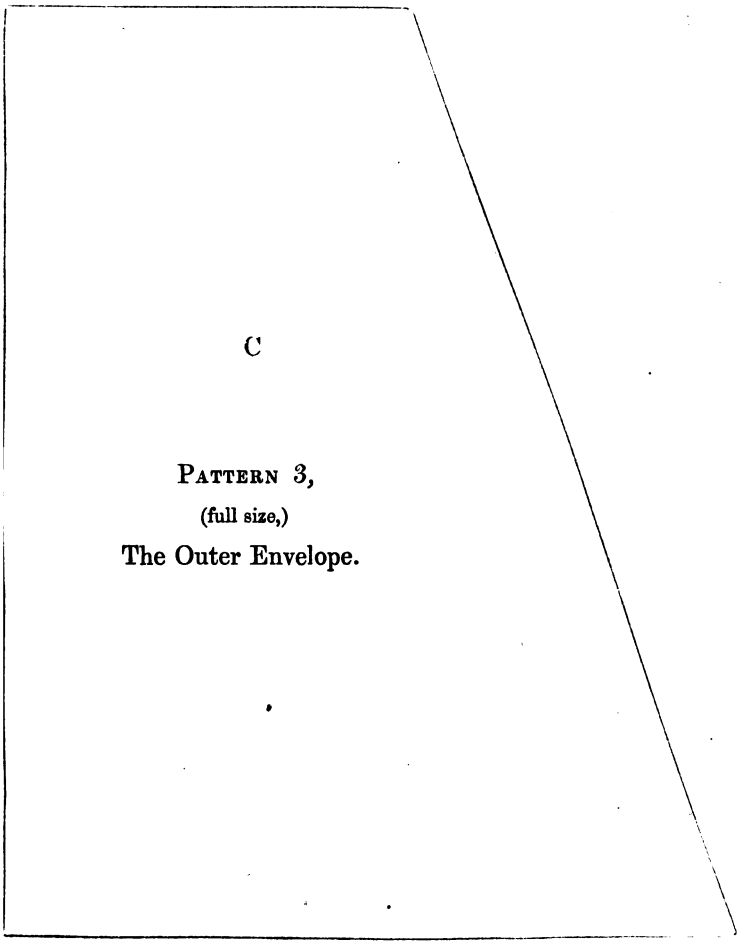


PLATE XV.

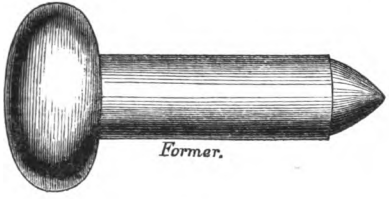


PATTERN 3,

(full size,)

The Outer Envelope.

Mandril.



Former.

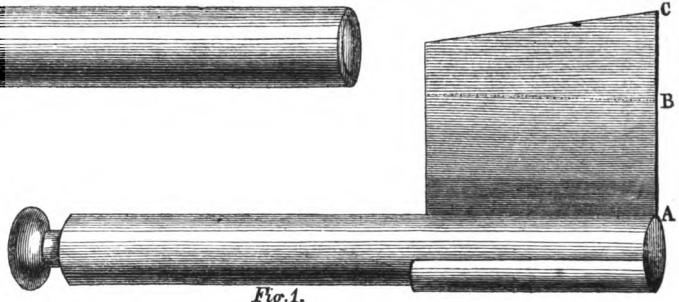
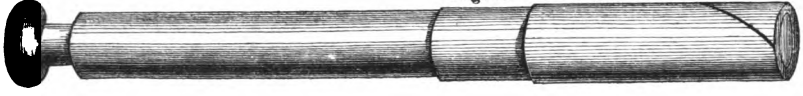


Fig.1.

Fig.3.



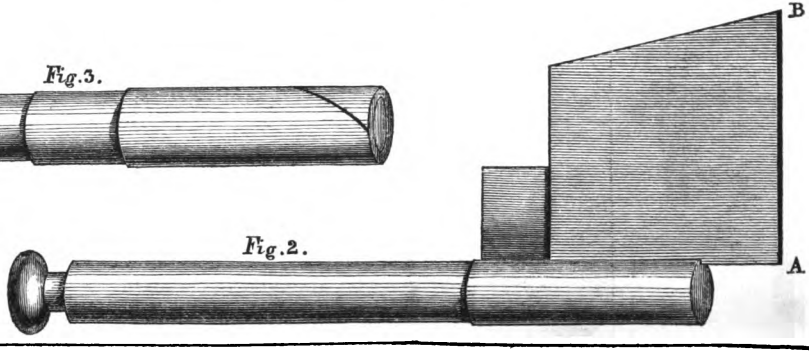


Fig.2.

PLATE XVI.

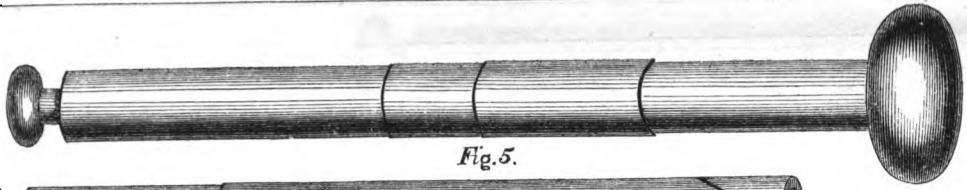


Fig. 5.

Fig. 7.

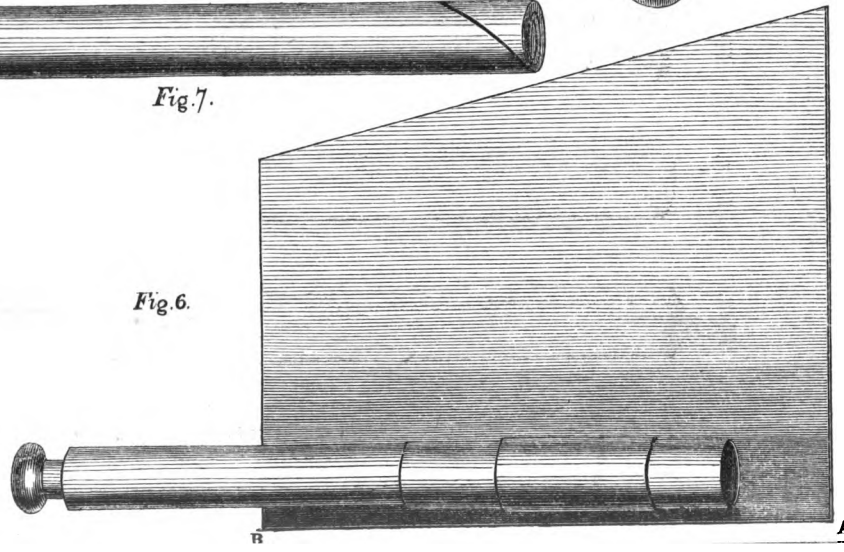


Fig. 6.

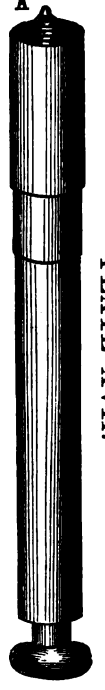
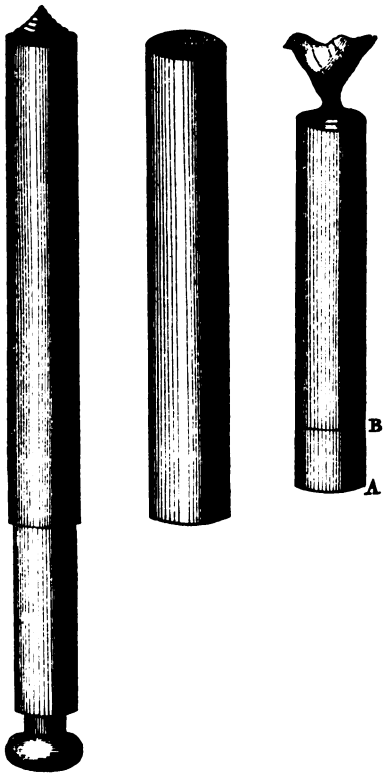


Fig. 4

PLATE XVII.

PLATE XVIII.

Fig.8. *Fig.9.* *Fig.10.*



CLEANING ARMS.

Every Soldier is to be taught the names of the different parts of his Rifle, and thoroughly acquainted with the rules for cleaning and keeping them in proper order. This is the first exercise in which the Soldier is to be instructed.—*Vide Queen's Regulations.*

Instruction under the head of "Cleaning Arms," Vide "Instructions of Musketry," should be conveyed to the Soldier in Eight Lessons, as follows, viz.:—

First Lesson.—Name the limbs of the lock, and the other principal parts of the Rifle, as also how to dismount the lock.

Second Lesson.—Names of the various parts of the limbs of the lock.

Third Lesson.—How to clean the lock and Rifle, and to keep them in a serviceable condition.

Fourth Lesson.—Remount the lock.

Fifth Lesson.—Explanation of the uses of the several parts of the lock, in two lessons.

Sixth Lesson.—Continuation of the Fifth Lesson.

Seventh Lesson.—How to guard against the Rifle and lock getting out of order, in two lessons.

Eighth Lesson.—Continuation of the Seventh Lesson, showing strongly the necessity of preserving the Rifle from the slightest injury, and a careful preservation of the ammunition.

FIRST LESSON.

Directions for Dismounting the Lock.

It will seldom be found necessary to take the Lock to pieces if proper care and attention has been taken of the Arm.

1st. Take out the tumbler pin.

2nd. Put the Lock at full cock, and take off the main spring. To do this, take the cramp (Plate X. fig. 1), and remove the screw drawer from the nipple wrench; then place the hook of the cramp on the return of the main spring, press the cramp well to the lock plate. See that the stud of the cramp is close to the bend of the main spring. Let the hammer down so as to take it off the bearer; then lift the stud of the main spring gently out of the plate, the spring remaining in the hook of the cramp.

3rd. Take off the sear spring. To do this, unscrew two or three threads of the sear spring pin. Put the edge of the turnscrew under the bend of the spring, so as to lift the stud of the spring from the lock plate; then unscrew the pin entirely, and remove the spring.

4th. Unscrew the sear pin, and remove the sear.

5th. Unscrew the bridle pin, and remove the bridle; if the stud of the bridle should stick, tap

upon the lock plate with a piece of wood, and so loosen the stud.

6th. Take off the hammer. To do this, let the body of the hammer rest fairly in the hollow of the left hand, and in the position of half cock; then give a few smart taps on the inside of the neck of the hammer, until it gradually leaves the squares of the tumbler.

7th. Take out the tumbler.

8th. Remove the swivel from the tumbler.

Whenever there are more than one stand of Arms being dismounted in the same place, the Soldier should place carefully the parts of his own Rifle in some receptacle, which will prevent them from being lost or intermixed with other Arms.

The greatest possible care and attention is required on the part of Instructors, to see that their pupils dismount the Lock in a neat and proper manner; all awkwardness must be banished, as it requires great dexterity in taking it to pieces, and more so in putting it together. To do it well calls not only for much mechanical skill, and a light but firm hand; but it also requires a personal interest in the task, which none but the owner will ever feel. Many good gun locks have been spoilt by a careless hard-handed fellow doing too much, and many also by some lady-handed man doing too little.

N.B. For Second Lesson, vide page 34.

THIRD LESSON.

Instructions to Clean the Lock and Rifle, and to keep them in a serviceable condition.

1st. WHEN the Lock is dismounted take every part singly, and wipe it perfectly clean with an oiled rag, and afterwards with a dry one.

2nd. If any specks of rust are seen on any of the interior parts of the lock, lock plate, and particularly the tumbler axle hole, the same must be removed by dropping a little oil on the spot, and with the point of a bit of wood, rub the rust clean out, and wipe the surface dry; no brick-dust or powder of any kind is to be used for this purpose, as it would have the effect of removing from the limbsthus treated, (and which are not steel,) the case hardening, and thereby render them more liable to rust.

3rd. To keep the Lock in proper condition, observe that in remounting the Lock, the threads of the several pins, as also the pivot and axle of the tumbler, and the pivots of the swivel should be touched lightly with oil, before putting them in their respective places, so that they may work easily.

4th. The other frictional parts of the Lock to

which it is essential to apply oil (which should be animal, and not vegetable oil), are the nose of the sear where it touches the bents, and the toe of the sear spring where it touches the sear.

In oiling the parts bear in mind, that a great quantity of oil is not required. Put only the smallest drop with a feather, or with the point of the "drift," for by putting on too much oil, it is liable to clog the parts.

To Clean the Rifle.

1st. PLACE the Rifle at full cock, and take out the rod.

2nd. Put a piece of rag or tow into the jag and twist it round so as to cover it.

3rd. Hold the Rifle in the left hand, with the forefinger and thumb in line with the muzzle, and at the full extent of the arm, the barrel downwards, the heel of the butt resting on the ground.

4th. Pour about a quarter of a pint of clean water into the barrel with care, so as to prevent any of it getting between the stock and barrel or into the lock through the tumbler axle hole, or the snap cap that covers the nipple.

5th. Put the ramrod immediately into the barrel and sponge it carefully up and down, forcing the water through the nipple to remove the dirt or fouling, as also to clear the touch hole.

6th. Wipe the barrel well out with a dry rag, or tow, until it is clean and quite dry; after which, use an oiled rag, then put the muzzle stopper in the barrel, and the snap cap on the nipple; wipe the mouth of the hammer and let it down on the snap cap.

7th. The following morning, and upon every occasion before using the Rifle, wipe the barrel out clean and perfectly dry.

The fouling which settles on the stock near the nipple lump or trigger plate, should be removed with a rough rag; using water or scraping with a sharp instrument is strictly forbidden.

In order to prevent the water soaking into the stock, and at the same time to give it a smooth and polished appearance, rub it over with a little linseed oil, also apply a little bees' wax between the stock and barrel, and between the lock plate and stock; so as to prevent water getting under the barrel or into the lock.

If the interior of the barrel be allowed to become rusty, the increased resistance to the passage of the bullet will probably cause the latter to "strip" (or pass out of the grooving), or else the wood plug may be driven through the bullet, and the arm for the time rendered useless or dangerous.

FOURTH LESSON.

Remount the Lock.

1st. ATTACH the swivel to the shaft of the tumbler.

2nd. Place the axle of the tumbler in the axle hole of the lock plate, keeping the bearer well against the hind stud.

3rd. Place the bridle on the pivot of the tumbler, with the stud properly fixed in the lock plate, and screw home the bridle pin.

4th. Place the sear between the bridle and lock plate with its nose against the tumbler, and screw home the sear pin.

5th. Take the sear spring and partly screw it to the lock plate, then, with the thumb of the left hand, *press* * the spring against the body of the sear, until the stud enters the stud hole, then screw home the sear spring pin.

6th. Turn the lock over in the left hand, and place the hammer on the squares of the tumbler, in the same position as if down upon the nipple.

7th. Connect the pivots of the swivel to the claws of the main spring; put on the main spring, by

* Without this pressure, it is not easy to get the stud of the spring into the hole in the lock plate, and great care is also necessary to see that the stud sits fairly in its place.

placing its stud in the lock plate, with the catch under the fore stud, after which draw the lock up to full cock and take off the cramp.

Feel that the parts work smoothly together, by lifting the hammer and sear up and down two or three times, then let the hammer down to ease the spring. Great care must be taken that no grit or dirt gets between the tumbler and lock plate, or the bridle and tumbler, when putting the lock together.

FIFTH LESSON (IN TWO PARTS).

Explanation of the Uses of the several parts of the Lock, and how they may be put out of order. (In Two Lessons.)

The Main Spring.—This spring acts upon the tumbler to draw the hammer down upon the nipple, the stud which is attached to the return is necessary to keep it in its place, which, together with the fore stud, which secures the catch to the lock plate, presents a resistance by which the action of the spring is ensured.

The Sear Spring.—This spring acts upon the sear; the toe of the spring bears against the body of the sear, and presses it outwards, whenever the tumbler is revolved; by drawing the hammer backwards, thereby causing the nose of the sear to enter the half and full bent; and thus keeping the cock at half or

full cock as may be desired. The stud, which is attached to the return, is necessary to keep it in its place; and, together with the sear spring pin, secures it to the lock plate, thus presenting a resistance as to ensure a free action of the spring.

The Sear.—The sear acts as a stop on the movements of the tumbler by its nose entering the half or full bent; thus keeping the lock at half or full cock. The nose of the sear is so constructed as to fit the bents exactly. The arm of the sear is that part on which the trigger acts, to raise the nose out of the full bent of the tumbler, and thereby releasing it to the action of the main spring.

SIXTH LESSON (FIFTH CONTINUED).

The Bridle.—The bridle secures the tumbler and ear in their proper places in the lock plate; the stud (under the foot of the bridle) fits into the lock plate, and together with the sear and bridle pins keeps the bridle firm and in its place.

The Hammer.—The Hammer fits on the squares of the tumbler; it falls with great quickness and force upon the cap, thereby causing the explosion.

The Tumbler.—This is the most important part of the machinery of the lock, it holds the hammer and revolves in the lock plate and bridle; it is made very strong to sustain the force of the main spring; the notches, termed bents, are to retain the hammer in

the position of half or whole cock, *i.e.* to "cap" or explode; the half or lower bent in its construction has two angles, one acute, the other obtuse; such a formation is essential, so as to prevent the possibility of the sear nose being released by the action of the trigger; for whatever amount of pressure is applied thereto (if no imperfection exists) would only have the effect of breaking away either the half bent or the nose of the sear.

The full or upper bent is formed so as to allow the nose of the sear to be withdrawn from it with the least possible resistance, consequently these parts must coincide, the edge of the full bent and that of the half bent should be in the same arc of a circle, to ensure the proper action of the tumbler; if the latter projects, the lock will catch at half cock when the sear is released from the full bent; if it is cut away too much, the position of half cock is not secure. The shaft or lever is for the purpose of connecting the main spring to the tumbler by means of the swivel.

The Lock Plate.—This is the foundation of the lock, on which the several parts are fixed.

The fore stud, as before stated, is to secure the catch of the main spring as well as to offer a resistance to ensure its action. The hind stud acts as a break to prevent the tumbler from revolving beyond what has been considered necessary when acted upon by the main spring, whose action is consequently stopped.

To ensure a true and easy action of the lock, the

pins, pivots, &c., should be perpendicular to the lock plate.

The bridle pin is flat at the end, the other pins are rounded off. The bridle pin is the longest, the sear next, and the sear spring pin the shortest.

SEVENTH LESSON (IN TWO PARTS).

How to guard against the Rifle and Lock getting out of order. (In two lessons.)

The Pull Off.—It is a great error to suppose that by loosening the sear or any other pins an easier pull off can be ensured; such a measure is only calculated to impair the efficiency of the lock, and increase the wear and tear of the parts which are thereby thrown out of order. A perfect parallelism is most essential to secure the object required.

When the pull off is too great, it proves that the full bent and sear nose are not well adapted to each other, or that the sear spring is too strong.

The alteration that becomes necessary to remedy so serious a defect in a lock must be made by an armourer, and never attempted by the soldier.

Miss Fires.—The non-explosion of the cap is often attributed to the weakness of the main spring; this may sometimes be the case, but in the majority of instances, the cause may be traced to either dirt at the base of the touch hole, or to the dirty or rusty

state of the tumbler axle hole and axle of the tumbler; either of these two causes will impede the fall of the cock, and, as a natural consequence, likewise reduce the force of the blow so necessary to explode the cap.* It is therefore of the utmost importance, when cleaning the rifle, to prevent water entering the lock by the axle hole, or dirt remaining in the touch hole.

Wood Bound.—The Lock is often said to be wood bound by (what many suppose) the swelling of the wood when the rifle has been exposed in wet weather; such a circumstance, however, too often arises from screwing the lock to the stock by the side nails, beyond what is necessary, and thereby imbedding the parts of the lock into the wood work of the stock.

The side nails (as also the pins of the lock) should not, when screwed home, protrude beyond the outer side of the lock plate. The ends of the nails and pins (except the bridle pin, which is flat), should be rounded off to the lock plate, and present no edges.

EIGHTH LESSON.

THE value of the present Rifle over the smooth bore musket cannot be too highly estimated; but as

* Miss fires are also occasioned by an imperfection in the construction of the communication hole, or the nipple screw being too long; as a consequence, when the nipple is screwed down, part of the communication hole is closed, and thus prevents the powder from getting into the chamber. The armourer alone should remedy such a defect.

its value chiefly depends upon the straightness and perfection of the bore, you must, by bestowing care and attention to all its parts, prove that you regard it as a most valuable and delicate arm, but, if you act otherwise, you will find that the results will not come up to the real powers which the weapon is capable of performing.

The Barrel.

On no account whatever must the Rifle be used for carrying any weight, or for any purpose for which it is not legitimately intended; the barrel is very easily bent, and though the injury may be so slight as not to be perceptible to any but a practised viewer, it may be a sufficient cause to destroy the accuracy of the bore, and consequently of its shooting. If you suspect that the barrel is either bent or dented, the circumstance should be reported immediately.

Avoid all useless thumping and rattling of the Rifle.

In "Piling Arms," be attentive to the directions given that they may not become unlocked, and fall to the ground.

When on *Guard,* and when "*Guard Turn Out*" is called, be careful not to snatch the Rifle from the "Arm-rack" too suddenly; the bayonet may become strained, or the stock or barrel injured, particularly at the muzzle, which is about the thinnest part of

the barrel, and that part being the point of delivery causes an irreparable damage.

Be very particular when cleaning your Rifle not to rub or damage the "*fore-sight;*" this you may unthinkingly do, not knowing how greatly such damage may operate against you at the time of trial.

Keep the interior of your barrel perfectly free from rust and other damage, for if rust be allowed to accumulate in the barrel, a resistance will be offered to the passage of the bullet, causing it most probably to "strip," *i.e.* it may pass out of the grooving without attaining the rotatory motion which is actually essential to the accuracy of its flight. Rust in the barrel prevents a true expansion of the bullet, and renders the Rifle difficult to load. Rust is caused by the combined effect of moisture and air; the surest way, therefore, of preventing rust in the barrel and to keep the bore perfectly dry, keep the muzzle-stopper in the snap cap on the nipple, and the hammer down, so that the air may be excluded.

Be very careful when skirmishing not to run the muzzle of the barrel into the ground; if you should accidentally do so, immediately ask permission to *fall out,* and remove the dirt; for if you fire the Rifle without removing the obstruction, it is liable to burst the barrel in your hand, and do you a very serious injury. If your Rifle is not loaded, remove the dirt carefully, and wipe the barrel well out; for

if the dirt is rammed down with a charge, it will tear the barrel and destroy the surface of the bore.

Ammunition.

Be very particular that the inside of your pouches is clean, free from dirt or dust, which may adhere to the greased part of the cartridge, and thereby prevent the bullet from going down the barrel with the ease required.

Whenever you have any loose ammunition in your pouch—that is when a packet of ammunition has been broken into—fold up carefully the loose cartridges in paper that they may not shake about and become damaged. For the same reason always pack your ammunition in your pouches in such a manner as to be always ready for service, but having no vacant space between the packets.

Keep your powder dry; this is of the utmost importance, for bear in mind that damp powder will not send a bullet so far as powder that is perfectly dry, and is more liable to cause miss fires. Hence, then, the necessity of keeping the ammunition and percussion caps in a dry and serviceable state.

Whenever you are out on piquet, or other duty, in which your Rifle is likely to be exposed to rain when loaded, you may prevent the powder in the barrel from getting wet by removing the percussion cap, and placing the snap cap on the nipple instead. If you

have no snap cap, stop up the nipple hole with grease, and let the cock down upon it. If you cannot obtain any grease, drive a peg of soft wood into the nipple, and put the cap on it. Neither the grease nor the peg will in any way impede the action of the cap in igniting the charge, but both will disappear (if the percussion cap has been properly pressed home) in the explosion.

Whenever the grease round the bullet appears to have been removed from the cartridge, the sides of the bullet should be wetted in the mouth before it is put in the barrel, as the saliva will serve the purpose of grease for the time being.

Directions for Dismounting the Rifle.

1st. PUT the stopper into the muzzle of the barrel, take out the ramrod, pull the lock up to the half cock, and take it off. To do this hold the Rifle horizontally in the left hand, with the lock downwards, unscrew the side nails, and, if the lock should stick, tap lightly on the head of the side nails, so that it may fall into the left hand.

2nd. Place the muzzle on the ground (with the stopper in it), barrel towards the body and upright, partly unscrew the breech nail.

3rd. Reverse the position of the Rifle by placing the butt on the ground, the barrel upright and towards the body if the Rifle is fitted with spring

bands; press upon the springs with the two forefingers of the left hand, and with the forefinger and thumb of the right hand. Slip the bands over the springs, and take them off the barrel. If the Rifle is fitted with screw bands, turn the barrel to the front, and unscrew the bands just sufficient as will allow them to be taken easily off the rifle with the left hand.

4th. Reverse the Rifle by placing the muzzle on the ground, and take out the breech nail, after which take hold of the muzzle with the right hand, and lift it gently out of the stock; if the barrel will not leave the stock with ease, hold the Rifle by the stock in a slanting direction, the barrel downwards, and the left hand at the full extent of the arm, then tap the heel of the butt lightly on the ground, so as to start the tang of the breech pin from the wood.

Directions for Remounting the Rifle Musket.

Put the barrel into its place in the stock, having the breech properly settled; slip on the bands over the springs; touch the screw threads of the breech nail with oil, and screw it into its place (but not quite home). Pull the hammer up to the half bent, and put on the lock, screw home the side nails, and breech nail. Put in the ramrod, and ease the lock.

Directions for Cleaning the Stock.

Rub the Stock with a little linseed oil, after which wipe it well, and apply a little bees' wax, more especially round the lock plate, and between the Stock and barrel, so as to prevent wet entering either into the lock or between the Stock and barrel.

Vide Third Lesson.

Memorandum.

Horse Guards, 6th January, 1856.

The annexed "Directions for Cleaning Rifle Muskets" having been approved by the General Commanding-in-Chief, are promulgated to the Army with a view to the same being generally adopted.

By Command,

(Signed) G. Wetherall, A.G.

Directions for Cleaning Rifle Muskets.

1st. Place the Musket at full cock.

2nd. Pour about a quarter of a pint of clean water into the barrel; in doing this hold the Musket in the left hand, in a slanting direction, keeping the muzzle a little below the elbow of the arm with the barrel downwards to prevent any spilt water running between the barrel and the stock.

3rd. Put a piece of rag or tow into the tag and surround it with the same, put it into the barrel *immediately the water is poured in,* and rub it well up and down, forcing the water out of the barrel through the nipple vent, which repeat once or twice.

4th. Wipe the barrel well out with rag or tow until quite clean and dry, and then with an oiled or greased rag.

NOTE.—By this mode of cleaning, it is expected there will be little liability of the barrels becoming rusted, and seldom any necessity for removing the barrel from its stock, which is always objectionable, even with Muskets fitted with the break off.

Wipe out the oil or grease with a clean rag just before firing.

Method of Case Hardening.

Is performed by stratifying the various parts in an iron pan, with animal charcoal, prepared from bone and ivory dust, or old shoes; the whole is then exposed to a full red heat for about an hour, or according to the size of the work; the pan is withdrawn from the fire, and the contents thrown into a bucket of water. The rationale of this operation is that the surface of the iron becomes converted into steel by the absorption of the carbon, and the beautiful colours are produced *by the animal matter remaining in it,* the variegation of the colour being also affected by the quality of the iron.

Instructions to ascertain the Strength of the Springs of a Lock, and the Pull Off with and without Trigger.

Weight of main spring, or main spring draws at half cock from 13 to 14 lbs.	*Proof.*—Attach such a weight to the comb of the hammer, when the lock is at half cock, as will just move the hammer or over-balance the main-spring.
Weight of sear spring, or sear spring draws when the lock is at its bearings about 7½ lbs.	When the hammer is down, place a weight to the arm of the sear as will just lift it, or over-balance the sear spring.
Pull of the lock, or pull off without trigger from 13 to 14 lbs.	Place the lock at full cock, then attach a weight to the arm of the sear as will raise the nose out of the full bent to allow the hammer to fall.
Trigger draws, or pull off with trigger from 7 to 8 lbs.	Attach such a weight to the trigger, when the lock is at full cock, as will raise the sear nose out of the full bent to allow the hammer to fall.

The steelyard is used in these experiments or tests.

Browning Arms.

The following ingredients for the browning of arms are to be mixed and dissolved in one gallon of soft water, viz.:

6 ozs. spirits of wine.
6 „ tincture of steel.
2 „ corrosive sublimate.
2 „ sweet spirits of nitre.
3 „ nitric acid.

} The mixture is to be kept in glass, not in earthenware bottles.

Vide *Queen's Regulations*, p. 96, sect. 20.

Previously to commencing the operation of browning, the barrel is to be made quite bright with emery, or a fine smooth file (but not burnished), after which it is to be carefully cleaned from all greasiness; a small quantity of pounded lime, rubbed well over every part of the barrel, is the best for this purpose; a plug of wood is then to be put into the muzzle of the barrel, the nipple and touch-hole are to be stopped, and the mixture applied to every part with a clean sponge or rag.

After the application of the mixture, the barrel is to be exposed to the air in a warm room for twelve hours, after which time it is to be well rubbed over with a hard hair-brush, or armourer's brush, until the rust is entirely removed. The mixture is then to be applied again in the same manner as before and in six hours the barrel will be sufficiently cor-

roded for the operation of scratch-brushing. The process of scratching off the rust, and applying the mixture, is to be repeated twice or three times a day for four or five days, by which time the barrel will be of a dark brown colour.

The rust which is raised by each successive application of the mixture, is to be always removed at first with the hair-brush, previously to using the scratch-card, as the latter is otherwise found to remove the browning. The operation of scratch-carding is only to commence after the second application of the mixture.

When the barrel is sufficiently browned, and the rust has been carefully removed, it is to be placed in boiling water for three or four minutes, in order that the action of the acid mixture may be destroyed, and the rust prevented from rising again. The barrel while warm is to be rubbed over with sweet oil, or common olive oil. The operation of browning should be conducted in a dry and warm room; a temperature of about seventy degrees is the most favourable.

The operation of browning is to be renewed every two years.

List of Prices to be allowed to Armourer-Serjeants of Regiments for the Repair of Rifled Muskets, Pattern 1853.

DESCRIPTION OF REPAIR.	Arms fitted with solid bands and springs.			Arms fitted with screw bands and rammer springs.		
Stock.	£	s.	d.	£	s.	d.
A new Stock, and re-stocking complete	0	12	0	0	12	0
Splicing do., including splice — long	0	5	0	0	4	0
Splicing do., including splice — short	0	2	6	0	2	0
A new brass nose cap and fitting	0	0	9	0	0	9
A new brass handle, or guard and fitting	0	1	2	0	1	2
A new brass heel plate, and do.	0	1	3	0	1	3
A new brass box trigger plate, and re-fitting the trigger	0	1	3	0	1	3
A new brass side nail cap, and fitting	0	0	2	0	0	2
A new fore or shaft swivel, with nail and fitting	0	0	5	0	0	5
A do. handle swivel, and fitting	0	0	4	0	0	4
A do. trigger, filed up, fitted, and hardened	0	0	6	0	0	6
A do. stopper for rammer, and fitting	0	0	2	0	0	2
A do. side or breech nail, filed, tapped, and hardened	0	0	6	0	0	6
A do. wood screw, fitted, and hardened	0	0	1	0	0	1
A do. wire pin, and fitting	0	0	0½	0	0	0½
A new rammer-spring, and do.	0	0	0	0	0	9
New bands, fitted and hardened, or blued — front with swivel	0	1	5	0	1	5
New bands, fitted and hardened, or blued — middle	0	0	10	0	0	10
New bands, fitted and hardened, or blued — back	0	0	10	0	0	10
A new band, spring, and fitting	0	0	4	0	0	0
A do. band screw, with nut and fitting	0	0	0	0	0	3
Lock.						
A new lock plate, filed, hardened, and fitted	0	2	6	0	2	6
A do. cock, filed, fitted, and hardened	0	2	3	0	2	3
A do. steel sear, filed, fitted, and hardened	0	1	5	0	1	5
A do. bridle, fitted and tempered	0	1	0	0	1	0
A do. main spring, to weigh from 13 to 14 lbs., at half bent, including fitting	0	2	0	0	2	0

DESCRIPTION OF REPAIR.	Arms fitted with solid bands and springs.			Arms fitted with screw bands and rammer springs.		
	£	s.	d.	£	s.	d.
A do. sear spring and fitting	0	1	0	0	1	0
A do. swivel, fitted and tempered	0	0	8	0	0	8
A do. steel nail, filed, tapped, and tempered { tumbler	0	0	4	0	0	4
{ lock of sorts	0	0	3	0	0	3
Barrel.						
A new nipple and fitting	0	0	6	0	0	6
Clipping the breech pin	0	0	9	0	0	9
A new front sight, filed up and fitted	0	0	8	0	0	8
A do. elevating sight bed and fittings	0	2	0	0	2	0
A do. do. do. flap do. do.	0	2	0	0	2	0
A do. slider for sight do. do.	0	0	9	0	0	9
A do. cap or top piece for sight and do.	0	0	8	0	0	8
A do. sight spring and fitting	0	0	8	0	0	8
A do. sight screw and do.	0	0	2	0	0	2
A do. centre pin for joint of sight, and fitting	0	0	2	0	0	2
A do. elevating sight, including soldering on, adjusting, cleaning off, and browning bed of sight	0	7	4	0	7	4
Graduating and making bed of sight	0	0	1	0	0	1
Do. do. do. flap do.	0	0	2	0	0	2
Browning barrel, including smoothing	0	1	0	0	1	0
Bayonet.						
A new bayonet, with locking ring complete, including fitting and adjusting, &c.	0	6	6	0	6	6
A new locking ring and fitting	0	1	3	0	1	3
A do. screw or stud for locking ring	0	0	2	0	0	2
Setting bayonet when bent	0	0	0	0	0	3
Rammer.						
A new steel rammer complete	0	2	0	0	2	0
Tapping thread for worm	0	0	1	0	0	1

Vide Queen's Regulations, p. 101.

DIRECTIONS

FOR

MAKING CARTRIDGES

AND

GUNPOWDER.

Manufacture of Cartridges.

THE following articles for the instruction of Soldiers in the Making of Cartridges is supplied to each barrack by the War Department. Vide *Instructions of Musketry*, p. 49.

One Set of Implements, viz.:

Five tin Measures, 2½ drams each.

Five tin Funnels (long narrow spouts).

Twelve Mandrels of hard wood for Cartridge Pattern, 1853.

Twelve Formers.

One set of Tin Patterns to show the size and shape of paper for Cartridge.

One Iron straight edge.

One large Knife.

Twenty quires of White Paper for inner and outer envelopes.

Six quires of Cartridge paper for Cylinder of Cartridge.

Half bushel of fine sand.

Fifty bullets for Rifle Musket, 1853.

After cutting the paper according to the patterns A B and C, place the Mandrel on the stiff paper, the base even with the side A C; roll the stiff paper on the Mandrel as far as B (Fig. 1), insert the inner envelope between the roll of the stiff paper, keeping the side A B ¾ of an inch from the base of the Mandrel (Fig. 2); roll the whole tightly on the Mandrel (Fig. 3), place it vertically (Fig. 4), and fold or twist the remainder of the envelope that overlaps the stiff paper into the hollow in the base of the Mandrel (A). Make use of the point of the Former to close the folds (Fig. 5); examine the bottom of the inner case thus formed, to see that there remains no hole for the escape of the powder when charged.

Introduce the point of the bullet well into the aperture of the powder case. Place the Mandrel and bullet parallel to the side A B, and the base of the bullet at ½ an inch from the base A C of the outer envelope (Fig. 6); press the point of the bullet into the cavity, roll the envelope tightly on the bullet and on the Mandrel (Fig. 7), twist or fold the remainder of the envelope, and tie it as close as possible to the base of the bullet (Fig. 8); place the base of the Cartridge on the table, withdraw the Mandrel, squeezing the edge of the powder case with the thumb nail of the left hand, and raising up the Mandrel with the right hand (Fig. 9).

To charge the Cartridge, introduce the point of the funnel * into the bottom of the case of the Cart-

*A copper funnel should always be used when making service cartridges.

ridge; pour in 2½ drachms of fine grain powder (or sand) from the powder flask; withdraw the funnel, taking care that none of the powder escapes between the case and the envelope, squeeze the top of the Cartridge (Fig. 10) and twist it inwards, forcing it a little into the case.

When completed, the base of the Cartridge (Fig. 10, A) must be dipped up to the shoulder of the bullet B in a pot of grease, consisting of one part of tallow to five of bees' wax.

Gunpowder.

GUNPOWDER is a composition of sulphur, saltpetre, and pounded charcoal; these three ingredients, when mixed together in proper quantities, form a very inflammable substance. A single spark is sufficient to inflame in an instant the largest mass of this composition.

The expansion, suddenly communicated either to the air lodged in the interstices of the grains of which it consists, or to the nitrous acid which is one of the elements of the saltpetre, produces an effort which nothing can resist; and the most ponderous masses are driven before it with inconceivable velocity.

Sulphur is generally found ready formed in the vicinity of volcanoes, and almost in a state of purity.

Saltpetre, or what is chemically called nitrate of potash, is found in a natural state, but in small quantities. In India it is sometimes found on the surface of the ground, and sometimes on the surface of calcareous walls, the roofs of cellars, and under the arches of bridges. As charcoal is so well known, I shall only observe that the wood selected for the manufacture of gunpowder are the willow, Alder, or black dog-wood; the latter is generally used in making the best sporting powder, the two former for Government powder.

Gunpowder is made of the three ingredients already named, which are combined in the following pro-

portions: for each 100 parts of gunpowder, salpetre 75 parts, charcoal 15, and sulphur 10.

The several ingredients being thus prepared, are sent to the mixing house; there they are ground separately to a fine powder, and carefully weighed in the proper proportions; they are then sifted into a large trough, and well mixed together by the hands. The composition, after being mixed, is taken to the powder mill, which is a light brick or wooden building, having in the centre two stones placed vertically and fixed to an horizontal axis traverse; these mill stones weigh from three to four tons, and make about nine or ten revolutions in a minute; beneath them, and placed in a circular trough, is a smooth cast-iron or stone bed; on this bed the composition is spread out; a sufficient quantity of water is put on it so as to reduce it to a body, but not so much as would form it into a paste. After the mill stones (or runners as they are sometimes called) have made the necessary revolutions over the composition, (which is generally regulated according to the state of the atmosphere,) it is taken off the bed in form of mill cake, and taken to the press house, where it is firmly pressed between plates of copper, worked by means of a powerful screw until it is formed into a hard and firm mass. After this process it is taken from the press in slabs resembling slate. It is then broken into small pieces with wooden mallets, and taken to the corning house to be granulated; this is done by putting the broken pieces into sieves, the bottoms of

which are made of parchment skins or bullocks' skins, prepared like parchment, with round holes punched through them about two-tenths of an inch in diameter. Several of these sieves are secured to a frame. Upon the press cake in each sieve is placed two pieces of lignum vitæ, six inches in diameter, and two or three inches in thickness; so that when the frame which is attached to the machinery is put into rapid motion, the circular pieces of lignum vitæ presses upon the powder, breaks the lumps by the velocity in which it moves, and thereby forces it through the holes in grains of several sizes on to the floor. It is then separated from the dust by being sifted through finer sieves, and also to classify the grain.

The grains are next hardened, and the rough edge taken off by friction against each other in barrels, or in a close reel, which is moved in a circular direction, making about forty revolutions in a minute; by this process also the grains become glazed. The object of glazing is to break off the acute angles from the grains, and to give the powder a more finished appearance; it however diminishes rather than increases the strength.

The gunpowder thus corned, dusted, and glazed, is then sent to the stove to be finally dried by an artificial temperature of 140 degrees Fahrenheit, which is suffered gradually to decline. The last process is taking it to the dusting house, where it is sifted into grains of various sizes, and afterwards through a fine wire or canvas reel, to free it from all dust.

"If gunpowder is injured by damp in a small degree, it may be recovered by again drying it in a stove; but if the ingredients are decomposed, the nitre must be extracted, and the gunpowder re-manufactured."—*Hutton.*

There are several methods of proving and trying the goodness and strength of gunpowder. The following is one by which a tolerably good idea may be formed of its purity, and also some conclusion as to its strength.

Lay two or three small heaps, about a drachm or two of the powder, on separate pieces of clean writing paper; fire one of them by a red-hot wire; if the flame ascends rapidly, with a good report, leaving the paper free from specks, and without burning holes in it; and if sparks fly off and set fire to the adjoining heaps, the goodness of the ingredients, and proper manufacture of the powder, may be safely inferred; but if otherwise. it is either badly made, or the ingredients are impure.

Physical causes of its inflammation and exploding. —"Gunpowder being composed of the above ingredients, when a spark falls on this mixture, it sets fire to a certain portion of the charcoal, and the inflamed charcoal causes the nitre with which it is mixed, or in contact, to detonate, and also the sulphur, the combustibility of which is well known. Portions of the charcoal contiguous to the former take fire in like manner, and produce the same effect in regard to the surrounding mass; thus the first portion

inflamed, inflames a hundred others; these hundred communicate the inflammation to ten thousand; the ten thousand to a million, and so on. It may be easily conceived that an inflammation, the progress of which is so rapid, cannot fail to extend itself, in the course of a very short time, from the one extremity to the other of the largest mass.—*Hutton*, p. 75.

The following extract from Mr. W. Greener's "Gunnery, 1858," may prove interesting, and thereby induce young soldiers to read such works placed at their disposal in the barrack libraries, as will satisfy them of the cause of such a curious fact.

"If a train of gunpowder be crossed at right angles by a train of fulminating mercury, laid on a sheet of paper on a table, and the gunpowder lighted by a red-hot wire, the flame will run on until it meets the cross train of fulminating mercury, when the inflammation of the latter will be so instantaneous as to cut off the connection with the continuous train of gunpowder, leaving one-half of the train unignited:" and again,—"If the fulminating powder be lighted first, it will go straight on, and pass through the train of gunpowder so rapidly, as not to inflame it at all." "Mr. Greener says, "the cause is quite apparent; the rapidity of combustion condenses the air so quickly, as to remove the grains of gunpowder liable to come in contact with the flame, and to form the condensed air into a line of demarcation: for heat cannot be taken up by the

air quicker than the atmosphere will convey sounds, and before the heat can evaporate, the explosion is over, and is consequently noiseless."

The history of opinions respecting the explosive force of gunpowder, and all alike pretending to be deduced from experiments, is scarcely less amusing than the hypothesis respecting the cause, although rendered much more marvellous by their extraordinary discrepancy.

John Bernoulli considered the initial force as equal to 100 times the pressure of the atmosphere; whilst Daniel Bernoulli made it 10,000, Bracehus determines it at 450. D'Antone as lying between 1,400 and 1,900, and Ingenhouz at 2,276. According to Dulacy it is 4,000, by Amontons it is estimated at 5,000, and by Lombard it is stated at 9,215. After this there is a rapidly increasing estimate among other experimenters. Monsieur le Genéral de la Martillière representing it at 43,600, Count Rumford at 54,750; and Monsieur Gay de Vernon, who outdoes all his competitors, stating it as making from 30,000 to 80,000."—*Edinburgh Encyclopædia.*

Percussion Powders.

Mr. Blaine, in his "Encyclopædia of Rural Sports," says, that the first fulminating powder was composed of oxymuriate of potash, fine charcoal,

and sulphur, in various proportions; but a common one as follows. To any given quantity of the first article, add one-eighth of the second, and one-sixteenth of the third.

Dr. Ure, in his "Chemical Dictionary," gives a very clear condensed account of the chemical properties and method of manufacturing this powder. "A hundred grains of mercury are to be dissolved by heat in an ounce and a half by measure of nitric acid. This solution being poured cold into two ounces (by measure) of alcohol in a glass vessel, heat is to be applied till effervescence is excited. A white vapour undulates on the surface, and a powder is gradually precipitated, which is to be immediately collected on a filter, well washed, and cautiously dried with a very moderate heat.

This powder detonates loudly by gentle heat, or slight friction. Should any attempt be made to make this powder in any considerable quantity, the process must be conducted accordingly."

The fulminating mercury (according to the same authority), should be moistened with thirty per cent. of water, then triturated in a mortar, and hereafter mixed with the sixth part of its weight of gunpowder. Matches, caps, &c., thus made to resist damp, and do not corrode the instrument which contains the powder.

They will even take fire after several hours immersion in water, whereas the priming powder, made with chlorate of potash, sulphur, and charcoal, at-

tracts moisture speedily, and corrodes every metal it comes in contact with, consequently is injurious to the gun it is used with.

The Parisian percussion caps are all of them thus made, and are sold at the rate of six francs the thousand. *The Bulletin des Sciences Militaires* states, that the cap-match is made thus:—"Having triturated ten parts of fulminating mercury on a marble slab with water by means of a wooden muller, add six parts of gunpowder, and grind the two together."

Of these military cap-matches, each, it is said, contains one grain and a quarter of fulminating mercury, with six-tenths of that weight of cannon powder.

Percussion caps may be used over again if re-primed, by pressing them with a punch to fit, into an iron hole or mould, and a small quantity of percussion powder at the bottom, with a piece of paper pressed over it; or if caps cannot be had, three or four layers of paper cut to size, pressed into the mould with a punch, and primed with powder, similarly to the copper cap, will make a substitute.—*From Instructions on Naval Gunnery.*

THE END.

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